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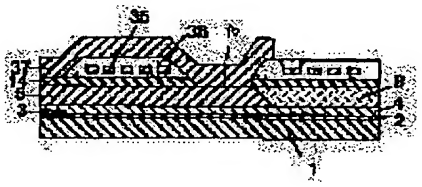
(54) COMBINED MAGNETIC HEAD AND ITS PRODUCTION

(57)Abstract:
PROBLEM TO BE SOLVED: To obtain a combined magnetic head which is free from the lift-off residue and fence of gap film in a back gap part and further a combined magnetic head having decreased recording defects.
SOLUTION: This combined magnetic head is constituted by forming a thin- film magnetic head after the formation of magnetoresistive head. Layers 8 for eliminating the difference in level of nearly the same height as the height of an upper shielding layer 5 are formed in the periphery where at least the back gap of the induction type magnetic head of the upper shield 5 patterned in a prescribed shape commonly used also as the lower magnetic core of the thin-film magnetic head is formed. The application of a lift-off resist on the upper shield 5 of a uniform and desired film thickness is made possible and the stable formation of the lift-off resist patterns for lifting off the gap film is made possible.



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DETAILED DESCRIPTION

[Detailed Description of the Invention]
[0001]
[The technical field to which invention belongs] this invention relates to the compound-die magnetic head used for magnetic storage like a magnetic disk unit, and its manufacture method. It is related with the compound-die magnetic head which can carry out record reproduction of the information with high density especially, and its manufacture method.
[0002]
[Description of the Prior Art] On a substrate, at least A lower shield, a lower gap, a magnetoresistance-effect element, The magnetoresistance-effect type head (MR head) which has an electrode, an up gap, and an up shield is formed. As the manufacture method of the compound-die magnetic head which forms the lower magnetic core which used the up shield also [upper part / of a magnetoresistance-effect type head], the gap for the thin film magnetic heads, a signal coil, a coil insulation layer, and the thin film magnetic head that has an up magnetic core The process which carries out patterning of the up shield film 5 to a predetermined configuration conventionally as shown in drawing 4 (drawing 4 -A), The process which applies the lower layer resist 17 and the upper resist 18 (drawing 4 -B), The process which forms the resist pattern for back gap section lift offs which consists of a lower layer resist 19 and the upper resist 20 by exposure, development, etc. (drawing 4 -C), What is depended on the process (drawing 4 -D) which forms the gap films 21 and 22, such as an alumina film, and the process (drawing 4 -E) which forms the gap film 21 and the back gap 16 of the induction-type magnetic head by carrying out the lift off of the gap film 22 is known.
[0003] It is shown to JP,6-176319,A by by forming evenly the film surface itself which serves as the up shield of the lower magnetic core of the thin film magnetic head, and an MR head as the manufacture method of the compound-die magnetic head that it is possible to form evenly the gap film 21 of the thin film magnetic head.
[0004]
[Problem(s) to be Solved by the Invention] however, the lower layer resist 17 for forming the resist pattern for back gap section gap film lift offs is applied also with the above-mentioned conventional technology, without canceling the level difference of the up shield 5 and the up gap 4, as shown in drawing 4 -B For this reason, the lower layer resist 17 becomes thick gradually as application thickness becomes thin and separates from the edge of the up shield 5 at the edge of the up shield 5 which the level difference with the up gap 4 has produced. The back gap section lift-off pattern enlarged view of drawing 4 -C is shown in drawing 5 . Since the distance (D in drawing 5) of the edge of the upper resist pattern 20 of the resist pattern for back gap section lift offs and the upper-limit section of the taper section of the up shield 5 is formed about several micrometers and near the up shield edge, the undercut height by the side of the up shield edge of the resist pattern 20 (T2 in drawing 5) serves as a configuration smaller than the undercut height by the side of an up shield center section (S2 in drawing 5). If the undercut height T2 is small, the gap film 22 will be connected between the upper part of the resist pattern 20, and an up shield, and the lift off of it will become impossible. Moreover, conversely, if the undercut height S2 is large, the enter lump by the undercut section of the gap film 21 will

become large, a fence will occur in the undercut section, and it will become a problem. Moreover, although it is good to thicken application thickness of the flat part of the lower layer resist 17 in order to enlarge the undercut height T2 by the side of an up shield edge, there is a problem that the undercut height S2 by the side of the center section of the up shield will become large too much.

[0005]

[Means for Solving the Problem] In order to solve the above-mentioned technical problem, at least on a substrate A lower shield, a lower gap, The magnetoresistance-effect type head (MR head) which has a magnetoresistance-effect element, an electrode, an up gap, and an up shield is formed. In the manufacture method of the compound-die magnetic head which forms the lower magnetic core which used the up shield also [upper part / of a magnetoresistance-effect type head], the gap for the thin film magnetic heads, a signal coil, a coil insulation layer, and the thin film magnetic head that has an up magnetic core The level difference of the level difference section circumference (partial circumference in which the back gap of the thin film magnetic head is formed at least) of the up shield by which patterning was carried out to the predetermined configuration which serves as the lower magnetic core of the thin film magnetic head is canceled, and the resist pattern for back gap section lift offs is formed. The gap and back gap of the thin film magnetic head are formed by forming and carrying out the lift off of the insulator layers, such as an alumina which serves as a magnetic-gap film on it.

[0006] By having canceled the level difference of the up shield circumference, the application thickness of the lower layer lift-off resist on an up shield becomes uniform. Therefore, similarly the up shield edge side undercut height of the back gap section lift-off pattern formed of exposure and development and up shield center-section side undercut height can be formed. Therefore, the lift-off remainder and the fence of a gap film are not produced in the back gap section by applying a lower layer lift-off resist by suitable application thickness to the thickness of a gap film.

[0007]

[Embodiments of the Invention] Hereafter, the example of this invention is explained using a drawing.

[0008] Drawing 1 is the cross section of the compound-die magnetic head which is one example of this invention. A magnetoresistance-effect type head consists of up shields 5 formed in the lower shield 1 formed on the substrate (ellipsis on a drawing), the lower gap 2, the magnetoresistance-effect element 3, the up gap 4, and the predetermined configuration. Furthermore, the up shield 5 is made to serve a double purpose as a lower magnetic core, and the thin film magnetic head is formed on this magnetoresistance-effect type head. Besides, the section shield 5 has the taper configuration and a level difference is formed between the front face of the up shield 5, and the front face of the up gap 4. This thin film magnetic head has the level difference dissolution layer 8 of the almost same height as the up shield 5 on the up gap 4, and the front face of the up shield 5 and the level difference dissolution layer 8 is flat. Furthermore, it has this up shield 5, the gap film 14 for the thin film magnetic heads formed on the level difference dissolution layer 8, the coil insulation layer 36 and the signal coil 35, and the up magnetic core 37. The coil insulation layer 36 divides the gap film 14 for the thin film magnetic heads, is formed, and forms the back gap 16.

[0009] Drawing 2 and drawing 3 are drawings showing the manufacture method of this compound-die magnetic head in this example.

[0010] First, although not illustrated, insulator layers, such as an alumina, are formed on a substrate.

[0011] Next, as shown in drawing 2 -A, the lower shield 1 is formed on insulator layers, such as the aforementioned alumina, although not illustrated, the electrode and the up gap 4 for MR elements are formed one by one, and the up shield 5 is formed further the lower gap 2, the MR element 3, and here. From a viewpoint on magnetic properties, the signal coil for the thin film magnetic heads, and up magnetic-core formation, patterning of the up shield 5 is carried out to the predetermined configuration, and by this example, patterning is carried out so that it may become a taper configuration. Moreover, the thickness of the up shield 5 is about 2-3

micrometers.
[0012] As shown in drawing 2 -B, the lift-off pattern which consists of a lower layer resist pattern 6 and an upper resist pattern 7 is formed on the up shield 5. In order to form an undercut field, the lower layer resist pattern 6 is formed so that about 5 micrometers of the edge position may enter inside from the edge of the upper resist pattern 7. As thickness of the lower layer resist 6, there should just be about 1-5 micrometers of thickness of about 1-2 micrometers and the upper resist 7. The soffit position of the edge forms the upper resist pattern 7 so that it may be in agreement with the up position of the taper section of the edge of the up shield 5.
[0013] Next, as shown in drawing 2 -C, the insulator layers 8 and 9, such as an alumina, are formed by sputtering. Thickness of these insulator layers 8 and 9 is made equal to the thickness of the up shield 5.
[0014] Next, as shown in drawing 2 -D, a lift off is performed and the lower layer resist 6, the upper resist 7, and an insulator layer 9 are removed. An insulator layer 8 serves as the level difference dissolution layer 8 here, and the surrounding level difference of the up shield 5 is canceled. Moreover, as a level difference dissolution layer 8, although AlO2, SiO2, or aluminum2O3-SiO2 is desirable, you may be an organic poly membrane.
[0015] Next, as shown in drawing 2 -E, the lower layer resist 10 and about 1-2 micrometers of the upper resists 11 are applied on the up shield 5 and the level difference dissolution layer 8. The application thickness of the lower layer resist 10 should just have thickness of the same grade as the depository thickness of the gap film of the thin film magnetic head. Namely, what is necessary is just to be about 0.5-0.7 micrometers, when the depository thickness of a gap film is 0.5 micrometers, for example.
[0016] Since the level difference of the up shield 5 circumference is canceled, this lower layer resist 10 does not produce the ununiformity of the thickness of the lower layer resist 10 by the level difference, but it becomes uniform thickness on the up shield 5.
[0017] Next, as shown in drawing 3 -F, the lift-off pattern which consists of a lower layer resist 12 and the upper resist 13 is formed by exposure, development, etc. As for the obtained lift-off pattern, the undercut height T1 by the side of an up shield edge and the undercut height S1 of an up shield central site are formed equally.
[0018] Next, as shown in drawing 3 -G, the insulator layers 14 and 15, such as an alumina used as the gap film of the thin film magnetic head, are formed.
[0019] Next, as shown in drawing 3 -H, the gap 14 and the back gap 16 of the thin film magnetic head are formed by performing a lift off and removing the lower layer resist 12, the upper resist 13, and an insulator layer 15. a lift-off pattern -- an up shield edge side and a central site -- also in any, the same and suitable undercut height is obtained and the remainder of a gap film and generating of a fence are prevented by the back gap section by the lift off of a gap film
[0020] next, it is shown in drawing 3 -I -- as -- a conductor -- a coil 35, an insulator layer 36, and the up magnetic core 37 are formed
[0021] Although the compound-die magnetic head which is one example of this invention is created by the method explained above, it is possible also by other methods.
[0022] For example, the example of other manufacture methods is explained using drawing 6 and drawing 7 .
[0023] First, although not illustrated, after forming insulator layers, such as an alumina, on a substrate, as shown in drawing 6 -A, the lower shield 1 is formed on insulator layers, such as the aforementioned alumina, although not illustrated, the electrode and the up gap 4 for magnetoresistance-effect elements are formed one by one, and the up shield 5 is formed further the lower gap 2, the magnetoresistance-effect element 3, and here. Next, in order to process the up shield 5 into a predetermined configuration, the lift-off resist pattern 30 which has an undercut field is formed. the thickness of this resist pattern -- about 3 times of the thickness of an up shield -- it is -- ****ing . There should just be about 1-2 micrometers (H in drawing 6 -A) of height of an undercut field.
[0024] Next, as shown in drawing 6 -B, ion milling is performed and the up shield 5 is processed into the same predetermined taper configuration as the above-mentioned method. Next, as

shown in drawing 6 -C, the insulator layers 8 and 9, such as an alumina, are formed. Thickness of an insulator layer 8 is made into thickness of the same grade as the up shield 5.
[0025] Next, as shown in drawing 6 -D, the lift off of the lift-off resist pattern 30 and the insulator layer 9 is carried out. An insulator layer 8 serves as the level difference dissolution layer 8, and the surrounding level difference of the up shield 5 is canceled. It is the same as that of the process after drawing 2 -E of the 1st example, and the following processes are drawing 6 . - As shown in E - drawing 7 -I, it forms to the up magnetic core 37.
[0026] The example of the manufacture method of further others is explained using drawing 8 and drawing 9 .
[0027] First, like the 1st example, although not illustrated, after forming insulator layers, such as an alumina, on a substrate, as shown in drawing 8 -A, although not illustrated, the electrode, the up gap 4, and the up shield 5 of the magnetoresistance-effect element 3 are formed the lower shield 1, the lower gap 2, the magnetoresistance-effect element 3, and here.
[0028] Next, as an organic poly membrane, as shown in drawing 8 -B, a photoresist 40 is applied so that the upper surface may become flat.
[0029] Next, it etches until the upper surface of the up shield 5 is exposed and the upper surface of the up shield 5 and the upper surface of a photoresist 40 become the same height, as shown in drawing 8 -C. Thereby, the surrounding level difference of the up shield 5 is canceled. Next, at about 200-250 degrees C, suitable heat treatment is performed and the level difference dissolution layer 8 is stiffened.
[0030] It is the same as that of the process after drawing 2 -E of the 1st example, and the following processes are drawing 8 . - As shown in D - drawing 9 -H, it forms to the up magnetic core 37.
[0031] Thus, a photoresist is sufficient as the level difference dissolution layer 8.
[0032]
[Effect of the Invention] Since cannot produce the lift-off remainder and the fence of a gap film and they can be made the back gap section of the thin film magnetic head, poor magnetic recording can be lost.

[Translation done.]

CLAIMS

[Claim(s)]
[Claim 1] On a substrate, at least A lower shield, a lower gap, a magnetoresistance-effect element, The magnetoresistance-effect type head which has an electrode, an up gap, and an up shield is formed. In the compound-die magnetic head which forms in the upper part of a magnetoresistance-effect type head the gap for the thin film magnetic heads, a signal coil, a coil insulation layer, and the thin film magnetic head that has an up magnetic core The aforementioned coil insulation layer divides the aforementioned gap for the thin film magnetic heads, and forms the back gap. The aforementioned up shield is the compound-die magnetic head characterized by having the level difference dissolution layer of the almost same height as an up shield so that the level difference of the aforementioned up shield and an up gap may be canceled around this back gap being formed in at least.
[Claim 2] The aforementioned level difference dissolution layer is the compound-die magnetic head according to claim 1 characterized by being formed from an inorganic insulator layer.
[Claim 3] On a substrate, at least A lower shield, a lower gap, a magnetoresistance-effect element, The magnetoresistance-effect type head which has an electrode, an up gap, and an up shield is formed. In the compound-die magnetic head which forms in the upper part of a magnetoresistance-effect type head the gap for the thin film magnetic heads, a signal coil, a coil insulation layer, and the thin film magnetic head that has an up magnetic core The aforementioned coil insulation layer is the compound-die magnetic head characterized by dividing the aforementioned gap for the thin film magnetic heads, forming the back gap, and forming this back gap and the gap for the thin film magnetic heads on the insulating layer of the almost same height as the aforementioned up shield and an up shield.
[Claim 4] The process which is characterized by providing the following and which forms a resist, and the process which forms the insulator layer of the same thickness as the aforementioned up shield, The process which forms the level difference dissolution layer which cancels a level difference with an up shield on the aforementioned up gap by carrying out the lift off of the insulator layer on the aforementioned resist and the aforementioned resist, By forming the resist pattern for back gap section lift offs on this up shield by which the level difference dissolution was carried out, and forming and carrying out the lift off of the magnetic-gap film on it The manufacture method of the compound-die magnetic head characterized by having at least the process which forms the magnetic gap and back gap of the thin film magnetic head, the process which forms the signal coil for the thin film magnetic heads through the coil insulation film, and the process which forms an up magnetic core. The process which forms a lower shield on a substrate. The process which forms a lower gap on this lower shield. The process which forms a magnetoresistance-effect element and an electrode on this lower gap. The process which forms an up gap on this magnetoresistance-effect element, the process which forms an up shield on this up gap, the process which form a lift-off pattern on this up shield film, the process which uses this lift-off pattern as a mask, perform ion milling, and process an up shield film into a predetermined configuration, and the undercut section whose edge position and resist edge position of an up shield correspond on the this processed up shield.
[Claim 5] The process which forms the resist characterized by providing the following, forms the insulator layer of the still more nearly same thickness as the aforementioned up shield, and forms a level difference dissolution layer by carrying out the lift off of the insulator layer on the aforementioned resist and the aforementioned resist, By forming the resist pattern for back gap section lift offs on this up shield by which the l vel difference dissolution was carried out, and forming and carrying out the lift off of the magnetic-gap film on it The manufacture method of the compound-die magnetic head characterized by having at least the process which forms the magnetic gap and back gap of the thin film magnetic head, the process which forms the signal coil for the thin film magnetic heads through the coil insulation film, and the process which forms an up magnetic core. The process which forms a lower shield on a substrate. The process which forms a lower gap on this lower shield. The process which forms a magnetoresistance-effect element and an electrode on this lower gap. The process which forms an up gap on this magnetoresistance-effect element, the process which forms an up shield on this up gap, the process which form a lift-off pattern on this up shield film, the process which uses this lift-off pattern as a mask, p rform ion milling, and process an up shield film into a predetermined configuration, and the undercut section whose edge position and resist edge position of an up shield correspond on the this processed up shield.
[Claim 6] The proc ss which forms a lower shield on a substrate, and the process which forms a lower gap on this lower shield, The process which forms a magnetoresistance-effect element and an electrode on this lower gap, and the process which forms an up gap on this magnetoresistance-effect element, The process which forms an up shield on this up gap, and the process which forms a lift-off pattern on this up shield film, The process which uses this lift-off pattern as a mask, performs ion milling, and processes an up shield film

into a predetermined configuration, The process which forms the level difference dissolution layer which cancels a level difference with an up shield on the aforementioned up gap by removing until it applies an organic poly membrane so that the upper surface may become the upper surface and the flatness of the aforementioned up shield, and an up shield side is exposed, The process which stiffens this level difference dissolution layer with heat treatment, and by forming the resist pattern for back gap section lift offs on this up shield by which the level difference dissolution was carried out [aforementioned], and forming and carrying out the lift off of the magnetic-gap film on it The manufacture method of the compound-die magnetic head characterized by having at least the process which forms the magnetic gap and back gap of the thin film magnetic head, the process which forms the signal coil for the thin film magnetic heads through the coil insulation film, and the process which forms an up magnetic core.

[Translation done.]

* NOTICES *

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2.**** shows the word which can not be translated.
3.In the drawings, any words are not translated.

DESCRIPTION OF DRAWINGS

[Brief Description of the Drawings]
[Drawing 1] The cross section of the compound-die magnetic head which is one example of this invention
[Drawing 2] Drawing showing the manufacture method of the compound-die magnetic head which is one example of this invention
[Drawing 3] Drawing showing the manufacture method of the compound-die magnetic head which is one example of this invention
[Drawing 4] Drawing showing the manufacture method of the compound-die magnetic head by the conventional technology
[Drawing 5] The enlarged view of the back-on up shield gap section lift-off pattern in drawing 4 -C
[Drawing 6] Drawing showing other examples of the manufacture method of the compound-die magnetic head which is one example of this invention
[Drawing 7] Drawing showing other examples of the manufacture method of the compound-die magnetic head which is one example of this invention
[Drawing 8] Drawing showing the example of further others of the manufacture method of the compound-die magnetic head which is one example of this invention
[Drawing 9] Drawing showing the example of further others of the manufacture method of the compound-die magnetic head which is one example of this invention
[Description of Notations]
1 .... Lower shield
2 .... Lower gap
3 .... Magnetoresistance-effect element
4 .... Up gap
5 .... Up shield
6, 12, 19 .... Lower layer resist pattern
7, 13, 20 .... The upper resist pattern
8 .... Level difference dissolution layer
9 .... Insulator layer
10 17 .... Lower layer resist
11 18 .... The upper resist
14, 15, 21, 22 .... Gap film
16 .... Back gap,
30 .... Lift-off resist pattern
35 .... Signal coil
36 .... Insulator layer
37 .... Up magnetic core

[Translation done.]

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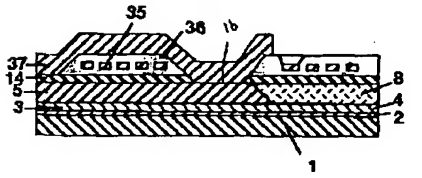
DRAWINGS

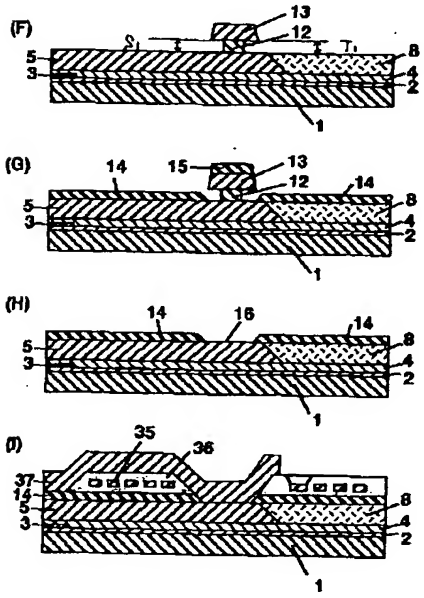
[Drawing 1]

図1



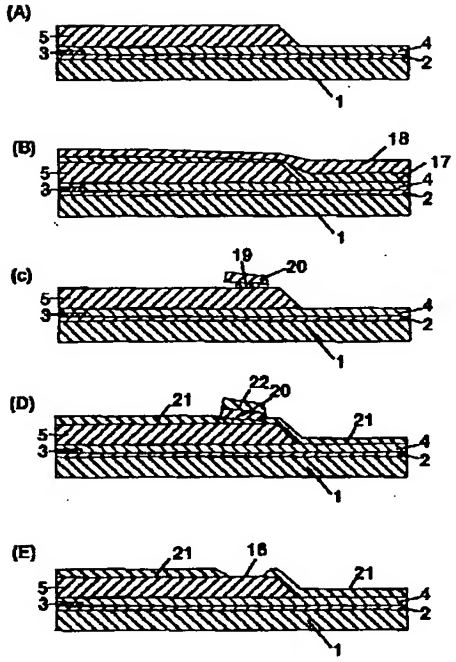
[Drawing 3]

図3



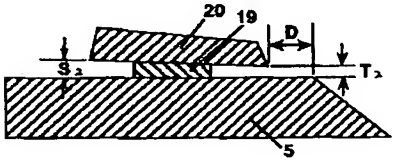
[Drawing 4]

図4



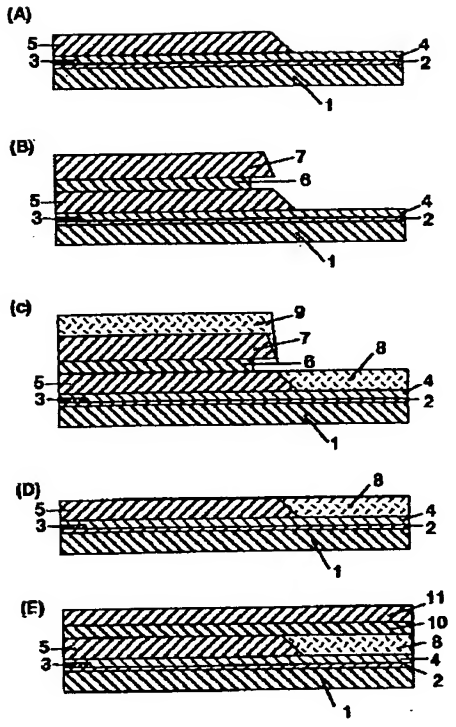
[Drawing 5]

図5



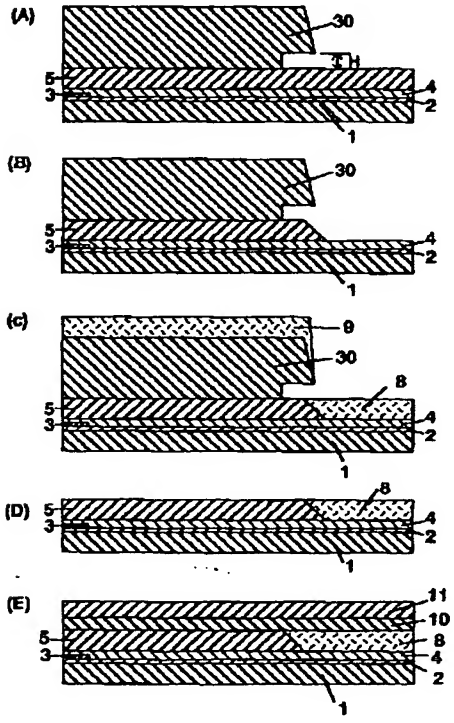
[Drawing 2]

図2



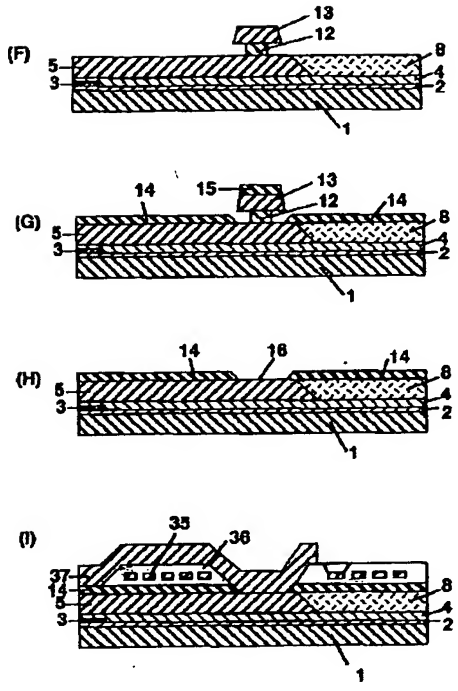
[Drawing 6]

図6



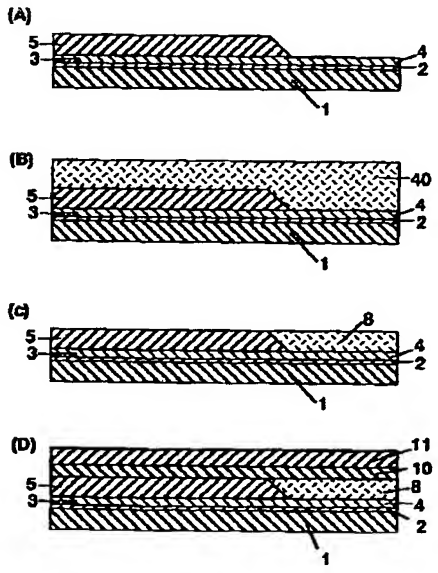
[Drawing 7]

図7



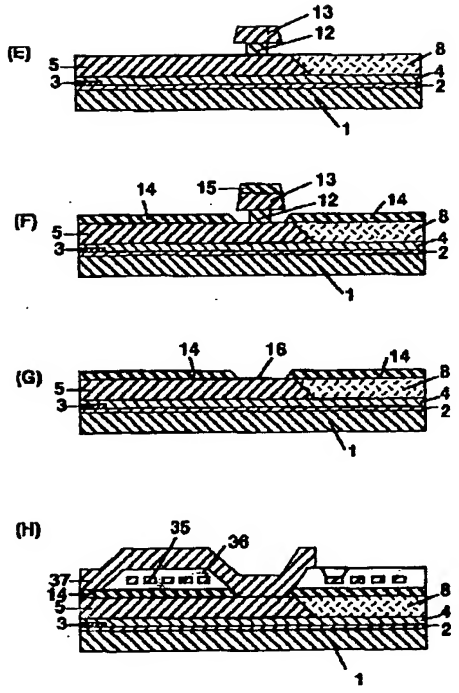
[Drawing 8]

図8



[Drawing 9]

図9



[Translation done.]

ド）を形成し、磁気抵抗効果型ヘッドの上部に、上部シールドを兼用した下部磁気コア、薄膜磁気ヘッド用ギャップ、信号コイル、コイル絶縁層、上部磁気コアを有する薄膜磁気ヘッドを形成している複合型磁気ヘッドの製造方法として、従来は図４に示すように、上部シールド膜５を所定の形状にパターニングする工程（図４－A）、下層レジスト１７及び上層レジスト１８を塗布する工程（図４－B）、露光、現像等により下層レジスト１９及び上層レジスト２０とからなるバックギャップ部リフトオフ用レジストパターンを形成する工程（図４－C）、アルミナ膜等のギャップ膜２１及び２２を成膜する工程（図４－D）、ギャップ膜２２をリフトオフすることにより誘導型磁気ヘッドのギャップ膜２１及びバックギャップ１６を形成する工程（図４－E）によるものが知られている。

【０００３】複合型磁気ヘッドの製造方法として特開平６－１７６３１９には、薄膜磁気ヘッドの下部磁気コアとMRヘッドの上部シールドを兼ねる膜面そのものを平坦に形成することにより、薄膜磁気ヘッドのギャップ膜２１を平坦に形成することが可能であることが示されている。

【０００４】

【発明が解決しようとする課題】しかし、上記従来技術によっても、図４－Bに示すように上部シールド５と上部ギャップ４との段差を解消することなく、バックギャップ部ギャップ膜リフトオフ用のレジストパターンを形成するための下層レジスト１７を塗布している。このため、下層レジスト１７は、上部ギャップ４との段差が生じている上部シールド５の端部で塗布膜厚が薄くなり、上部シールド５の端部から離れるに従い徐々に厚くなる。図４－Cのバックギャップ部リフトオフパターン拡大図を図５に示す。バックギャップ部リフトオフ用レジストパターンの上層レジストパターン２０の端部と上部シールド５のテーパ部の上端部との距離（図５中のD）が数μm程度と上部シールド端部近傍に形成されているため、レジストパターン２０の上部シールド端部側のアンダーカット高さ（図５中のＴ２）が上部シールド中央部側のアンダーカット高さ（図５中のＳ２）より小さい形状となる。アンダーカット高さＴ２が小さいと、ギャップ膜２２がレジストパターン２０の上部と上部シールドとの間でつながりリフトオフ不可能となる。また、逆に、アンダーカット高さＳ２が大きいと、ギャップ膜２１のアンダーカット部への入り込みが大きくなり、アンダーカット部にフェンスが発生し、問題となる。また、上部シールド端部側のアンダーカット高さＴ２を大きくするためには、下層レジスト１７の平坦部の塗布膜厚を厚くするとよいが、上部シールドの中央部側のアンダーカット高さＳ２が大きくなり過ぎてしまうという問題がある。

【課題を解決するための手段】上記課題を解決するためには、基板上に少なくとも下部シールド、下部ギャップ、磁気抵抗効果素子、電極、上部ギャップ及び上部シールドを有する磁気抵抗効果型ヘッド（MRヘッド）を形成し、磁気抵抗効果型ヘッドの上部に、上部シールドを兼用した下部磁気コア、薄膜磁気ヘッド用ギャップ、信号コイル、コイル絶縁層、上部磁気コアを有する薄膜磁気ヘッドを形成している複合型磁気ヘッドの製造方法において、薄膜磁気ヘッドの下部磁気コアを兼ねる所定の形状にパターニングされた上部シールドの段差部周辺（少なくとも薄膜磁気ヘッドのバックギャップが形成される部分周辺）の段差を解消してバックギャップ部リフトオフ用レジストパターンを形成する。その上に磁気ギャップ膜となるアルミナ等の絶縁膜を成膜し、リフトオフすることによって、薄膜磁気ヘッドのギャップ及びバックギャップを形成する。

【０００６】上部シールド周辺の段差を解消したことによって、上部シールド上での下層リフトオフレジストの塗布膜厚が均一になる。従って、露光、現像により形成されるバックギャップ部リフトオフパターンの上部シールド端部側アンダーカット高さと上部シールド中央部側アンダーカット高さとを同じに形成できる。従って、ギャップ膜の厚みに対して適当な塗布膜厚で下層リフトオフレジストを塗布することにより、バックギャップ部にギャップ膜のリフトオフ残り及びフェンスを生じない。

【０００７】

【発明の実施の形態】以下、本発明の実施例を図面を用いて説明する。

【０００８】図１は本発明の一実施例である複合型磁気ヘッドの断面図である。基板（図面上省略）上に形成された下部シールド１、下部ギャップ２、磁気抵抗効果素子３、上部ギャップ４、所定の形状に形成された上部シールド５から磁気抵抗効果型ヘッドは構成される。さらに上部シールド５を下部磁気コアとして兼用し、この磁気抵抗効果型ヘッド上に薄膜磁気ヘッドが形成される。この上部シールド５はテーパー形状を有しており、上部シールド５の表面と上部ギャップ４の表面との間には段差が形成される。この薄膜磁気ヘッドは、上部ギャップ４上に上部シールド５とほぼ同じ高さの段差解消層８を有しており、上部シールド５と段差解消層８の表面は平坦になっている。さらにこの上部シールド５と段差解消層８の上に形成された薄膜磁気ヘッド用ギャップ膜１４、コイル絶縁層３６、信号コイル３５、上部磁気コア３７を有している。コイル絶縁層３６は薄膜磁気ヘッド用ギャップ膜１４を分断して形成され、バックギャップ１６を形成している。

【０００９】図２及び図３は本実施例における同複合型磁気ヘッドの製造方法を示す図である。

【００１０】まず、図示していないが、基板上にアルミ

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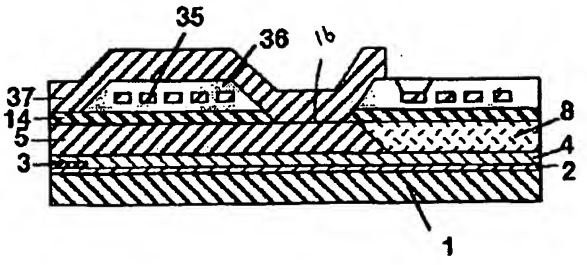
(54)【発明の名称】　複合型磁気ヘッドおよびその製造方法

(57)【要約】

【課題】バックギャップ部にギャップ膜のリフトオフ残り及びフェンスがない複合型磁気ヘッドを得る。さらに記録不良の少ない複合型磁気ヘッドを提供する。

【解決手段】磁気抵抗効果型ヘッド形成後に薄膜磁気ヘッドを形成する複合型磁気ヘッドにおいて、薄膜磁気ヘッドの下部磁気コアを兼用する所定の形状にパターニングされた上部シールド5の少なくとも誘導型磁気ヘッドのバックギャップが形成される周辺に上部シールド5とほぼ同じ高さの段差解消層8を形成する。上部シールド上でのリフトオフレジストを膜厚を均一かつ所望の厚さに塗布でき、安定にギャップ膜リフトオフ用のリフトオフレジストパターンを形成できる。

図1



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ト４０の上面が同じ高さになるまでエッチングを行う。これにより上部シールド５の周辺の段差が解消される。次に、段差解消層８を２００～２５０℃程度で適当な熱処理を行い、硬化させる。

【００３０】以下の工程は、第１実施例の図２－Ｅ以降の工程と同様で、図８－Ｄ～図９－Ｈに示す様に、上部磁気コア３７まで形成する。

【００３１】このように段差解消層８はホトレジストでも良い。

【００３２】

【発明の効果】薄膜磁気ヘッドのバックギャップ部にギャップ膜のリフトオフ残り及びフェンスを生じなくすることができるため，磁気記録不良をなくすことができる。

【図面の簡単な説明】

【図１】本発明の一実施例である複合型磁気ヘッドの断面図

【図２】本発明の一実施例である複合型磁気ヘッドの製造方法を示す図

【図３】本発明の一実施例である複合型磁気ヘッドの製造方法を示す図

【図４】従来技術による複合型磁気ヘッドの製造方法を示す図

【図５】図４－Ｃにおける上部シールド上ﾊﾞｯｸｷﾞｬｯﾌﾟ部ﾘﾌﾄｵﾌﾊﾟﾀｰﾝの拡大図

【図６】本発明の一実施例である複合型磁気ヘッドの製造方法の他の例を示す図

【図７】本発明の一実施例である複合型磁気ヘッドの製造方法の他の例を示す図

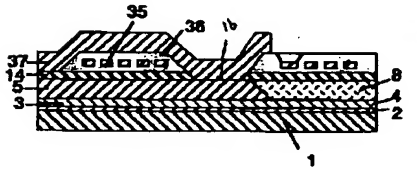
【図８】本発明の一実施例である複合型磁気ヘッドの製造方法のさらに他の例を示す図

【図９】本発明の一実施例である複合型磁気ヘッドの製造方法のさらに他の例を示す図

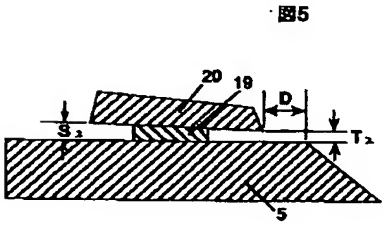
【符号の説明】

１……下部シールド
２……下部ギャップ
３……磁気抵抗効果素子
４……上部ギャップ
５……上部シールド
６、１２、１９……下層レジストパターン
７、１３、２０……上層レジストパターン
８……段差解消層
９……絶縁膜
１０、１７……下層レジスト
１１、１８……上層レジスト
１４、１５、２１、２２……ギャップ膜
１６……バックギャップ、
３０……リフトオフレジストパターン
３５……信号コイル
３６……絶縁膜
３７……上部磁気コア

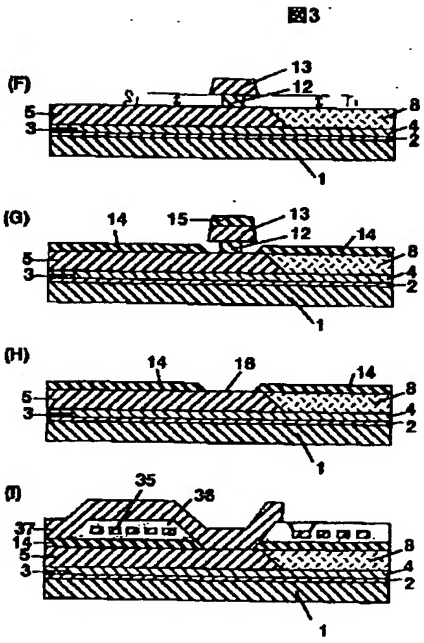
【図１】



【図５】



【図３】



【図４】